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## (54) RESIN COMPOSITION

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To obtain a composition having excellent film properties such as water resistance, mechanical strength, flexibility and the like by blending an acetoacetate group-containing polyvinyl alcohol-based resin and a polyvinyl alcohol-based resin having a specific value or more of an average polymerization degree.

**SOLUTION:** A resin composition contains (A) an acetoacetate group-containing polyvinyl alcohol-based resin and (B) a polyvinyl alcohol-based resin having an average polymerization degree of 2,600 or more, wherein the components A and B are blended in a weight ratio of the component A/the component B of 2/98 to 98/2. The component A is prepared by adsorbing an organic acid to polyvinyl alcohol and spraying a liquid or gaseous diketene in an inert gas atmosphere to react the same and has an acetoacetate group content of 0.1-15 mol% and preferably has a saponification degree of 80-98 mol%. The resin composition is dissolved to make an aqueous solution with a solid content of 0.5-70 wt.% and the solution is coated on a substrate in a coating weight of 0.5-40 g/m<sup>2</sup>. An overcoat layer on the surface of an ink-receiving layer is formed such that it has a thickness of 0.1-1,000  $\mu$ m after drying.

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**CLAIMS**

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[Claim(s)]

[Claim 1] (A) The resin constituent characterized by coming to contain acetoacetic ester radical content polyvinyl alcohol system resin and 2600 or more (B) average degree of polymerization polyvinyl alcohol system resin.

[Claim 2] (A) The resin constituent according to claim 1 characterized by content rate [ of acetoacetic ester radical content polyvinyl alcohol system resin and 2600 or more (B) average degree of polymerization polyvinyl alcohol system resin ] (A)/(B) being  $98 / 2 - 2/98$  (weight ratio).

[Claim 3] (A) The resin constituent according to claim 1 or 2 with which the acetoacetic ester radical content in acetoacetic ester radical content polyvinyl alcohol system resin is 0.1-15-mol %, and whenever [ saponification / of this polyvinyl alcohol system resin ] is characterized by 80-96-mol being %.

[Claim 4] (B) claims 1-3 to which whenever [ 2600 or more average degree of polymerization saponification / of polyvinyl alcohol system resin ] is characterized by 70-99.9-mol being % -- either -- the resin constituent of a publication.

[Claim 5] claims 1-4 characterized by using for the coating application of the record medium for ink jets -- either -- the resin constituent of a publication.

[Claim 6] The resin constituent according to claim 5 with which the coating application of the record medium for ink jets is characterized by being an overcoat layer.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** About the resin constituent of polyvinyl alcohol system resin (it may be hereafter written as PVA), in more detail, this invention is excellent in film physical properties, such as a water resisting property, a mechanical strength, and flexibility, and relates to the resin constituent of polyvinyl alcohol system resin useful for the coating application of the record medium for ink jets especially.

**[0002]**

**[Description of the Prior Art]** From the former, PVA is used abundantly at a dispersant, adhesives, the sizing agent, the film, the paper processing agent, etc., and it sets for a film application. Film physical properties, such as a water resisting property, a mechanical strength, and flexibility, are just going to be required, and it sets for a paper processing agent application further. It is used for the sizing agent of a general newspaper or a surface coating agent, an internal agent (yield improver), etc., and is utilized also for the binder of a sensible-heat layer and overcoat layer of a thermographic recording paper. Since there is an advantage, like there are few sounds at the time of printing which can perform multicolor printing, on the other hand, makes the ink made into the shape of a globule fly on the front face of recorded media, such as paper and PET, and high-speed printing can do the ink jet recording method which records an alphabetic character etc., recently, it comes to be used abundantly and PVA has come to be used also for the overcoat layer of the ink jet record medium (especially paper) which is this record medium. This ink jet record medium on base material front faces, such as paper, a titanium dioxide, The ink acceptance layer which consists of a synthetic silica, an alumina, a calcium carbonate, etc. is prepared. Furthermore, although the overcoat layer which consists of PVP (polyvinyl pyrrolidone), CMC (carboxymethyl cellulose), urethane, an emulsion, etc. is prepared in the front face and PVA has come to be used for this overcoat layer as mentioned above As a military requirement at this time, ink fixable, glossiness, a water resisting property, lightfastness, etc. can be mentioned, and using aceto acetylation polyvinyl alcohol as a binder of an overcoat layer is indicated by JP,61-125878,A as this cure.

**[0003]**

**[Problem(s) to be Solved by the Invention]** However, the above-mentioned JP,61-125878,A indication technique of a water resisting property is inadequate, and the further amelioration is just going to desire with it.

**[0004]**

**[Means for Solving the Problem]** Then, the resin constituent which comes to contain with (A) acetoacetic ester radical content polyvinyl alcohol system resin and a (B) average degree of polymerization of 2600 or more (further 3000 or more) PVA finds out agreeing for the above-mentioned purpose, and this invention person etc. came to complete this invention, as a result of repeating research wholeheartedly in view of this situation. That is, the resin constituent of this invention is excellent in film physical properties, such as a water resisting property, a mechanical strength, and flexibility, and provides the coating application of the record medium for ink jets with the resin constituent of useful polyvinyl alcohol system resin especially.

**[0005]**

[Embodiment of the Invention] This invention is explained in detail below. (A) acetoacetic ester radical content polyvinyl alcohol system resin (it may be hereafter written as the AA-ization PVA) used for this invention It is the thing which diketene was made to react to PVA, or made PVA and acetoacetic ester react and the ester interchange was carried out [ thing ] so that it might mention later, and made the acetoacetic ester radical introduce into PVA. As this PVA, the saponification object which generally saponified the lower alcohol solution of polyvinyl acetate according to saponification catalysts, such as alkali and an acid, or its derivative is used. The saponification object of the copolymer of vinyl acetate, the monomer which has copolymeric, and vinyl acetate etc. can also be used. Furthermore, as this monomer For example, ethylene, a propylene, an isobutylene, alpha-octene, alpha-dodecen, Olefins, such as alpha-octadecene, an acrylic acid, a methacrylic acid, a crotonic acid, partial saturation, such as a maleic acid, a maleic anhydride, and an itaconic acid, — acids, its salt, monochrome, or dialkyl ester Nitril, such as acrylonitrile and meta-acrylonitrile, acrylamide, Amides, such as methacrylamide, an ethylene sulfonic acid, an allyl compound sulfonic acid, Olefin sulfonic acids, such as a meta-allyl compound sulfonic acid, or the salt of those, and alkyl vinyl ether N-acrylamide methyl trimethylammonium chloride, allyl compound trimethylammonium chloride, Dimethyl diaryl ammonium chloride, a dimethyl allyl compound vinyl ketone, N-vinyl pyrrolidone, a vinyl chloride, a vinylidene chloride, the polyoxyethylene (meta) allyl compound ether, The polyoxyalkylene (meta) allyl compound ether, such as the polyoxypropylene (meta) allyl compound ether, Polyoxyalkylene (meta) acrylate, such as polyoxyethylene (meta) acrylate and polyoxypropylene (meta) acrylate, Polyoxyalkylene (meta) acrylamides, such as polyoxyethylene (meta) acrylamide and polyoxypropylene (meta) acrylamide, Polyoxyethylene (1-(meta) acrylamide -1, 1-dimethyl propyl) ester, Polyoxyethylene vinyl ether, polyoxypropylene vinyl ether, polyoxyethylene allylamine, polyoxypropylene allylamine, a polyoxyethylene vinyl amine, a polyoxypropylene vinyl amine, etc. are mentioned.

[0006] PVA used as the raw material of this formation PVA of (A) AA Although not limited especially, whenever [ saponification / 80-96 mol% (further 85-96 mol %) of ] is desirable. Whenever [ this saponification ] less than [ 80 mol % ] When a water resisting property falls, 96-mol % was exceeded conversely and it uses for the coating application of the record medium for ink jets, when it uses especially for an ink acceptance layer, the ink acceptance nature of water color ink will fall, and it is not desirable. Moreover, 1400-5000 (further 1700-5000, especially 1800-5000) are desirable, and if adhesion with an ink acceptance layer falls and the average degree of polymerization of PVA exceeds 5000 conversely when this average degree of polymerization uses for the coating application of the record medium for ink jets less than by 1400, it worsens and is not desirable [ average degree of polymerization / the coating nature at the time of this coating ].

[0007] (A) Although the approach to which PVA and diketene like the above are made to react, the approach of making PVA and acetoacetic ester react and carrying out an ester interchange, the approach of carrying out copolymerization of vinyl acetate and the acetoacetic-acid vinyl, etc. can be mentioned in order to obtain the AA-ization PVA, a production process is simple and it is desirable to manufacture from the point that the quality AA-ization PVA is obtained, by the approach to which PVA (powder) and diketene are made to react. After carrying out the direct reaction of the diketene PVA, a gas, or liquefied as an approach to which PVA and diketene are made to react and carrying out adsorption occlusion of the organic acid to PVA beforehand, the approach of spraying the diketene of liquefied or a gas, reacting under an inert gas ambient atmosphere, or spraying the mixture of an organic acid and liquefied diketene on PVA, and reacting to it is used. It is enough if it is equipment to which it could warm and the agitator was attached as a reactor at the time of carrying out the above-mentioned reaction. For example, a kneader, a Henschel mixer, a ribbon blender, other various blenders, and a churning dryer can be used.

[0008] It is desirable to consider as 0.1 - 15-mol % (further 0.3-9-mol %), and if sufficient water resisting property may not be obtained and the content of the acetoacetic ester radical of the formation PVA of (A) AA obtained in this way exceeds 15-mol % conversely when this content uses for an overcoat layer less than [ 0.1 mol % ], it arises [ new problems, such as coloring, ] and is not desirable.

[0009] Although PVA before introducing the acetoacetic ester radical of a publication into the above

as with a (B) average degree of polymerization of 2600 or more (further 3000 or more) PVA used for this invention, and same PVA can be used, in this invention, it is required to make this average degree of polymerization of PVA or more into 2600, and this average degree of polymerization cannot attain the purpose of this invention less than by 2600. Although especially the upper limit of this average degree of polymerization is not limited, 7000 or less are desirable and it is usually further 5000 or less. Although not limited, especially whenever [ this saponification / of PVA / 80-98 mol% (further 90-95 mol %) of ] is desirable, and if a water resisting property falls [ whenever / this saponification ] less than [ 80 mol % ], or ink spreads, or it may carry out (feather ring) and 98-mol % is exceeded conversely, it falls [ fixable / of ink / falls and / ink set nature ] and is not desirable.

[0010] The resin constituent of this invention is what consists of (A) like the above, and (B). Although especially the blending ratio of coal is not limited, A/B(weight ratio) = 2 / 98 - 98/2 (further 10 / 90 - 90/10, especially 20 / 80 - 80/20) are desirable, and they set to this weight ratio. (B) falls [ when excessive, adhesion with an ink acceptance layer falls / (A) / , and / when excessive / coating nature ] conversely, and is not desirable. In this way, although the resin constituent of obtained this invention is excellent in a water resisting property, an adhesive property, the reinforcement of a film, etc. and can be used for a dispersant, adhesives, a sizing agent, an emulsifier, a film, fiber, a paper processing agent, various coating applications, etc., especially, it is useful for the coating application of the record medium for ink jets, and this application is explained.

[0011] In using the resin constituent of this invention for the coating application of the record medium for ink jets, generally it is dissolved and used for water, but a solvent system is also usable. What is necessary is just to choose the class of solvent suitably according to a property, the blending ratio of coal, etc. of (A) and (B). In use of this resin constituent, it is used as coating liquid, and in preparation of this coating liquid, there is especially no limit and, in short, it should just mix the above-mentioned resin constituent with water. Although what is necessary is just to adjust concentration suitably according to the purpose, especially the concentration of this desirable resin constituent is usually chosen from 0.1 - 40 % of the weight, and about further 1 - 20% of the weight of the range in consideration of workability etc.

[0012] In this invention, although the resin constituent like the above is used, in raising a whiteness degree etc., it is desirable that the non-subtlety particle is blended, as this non-subtlety particle, a synthetic silica, colloidal silica, an alumina, etc. can be mentioned and silicon compounds, such as a synthetic silica and colloidal silica, are suitably used into this resin constituent. As a configuration of this non-subtlety particle, the shape of the shape of a globular shape, a grain, and powder and a rosary etc. is mentioned. Moreover, as the mean particle diameter 0.01-50 micrometers (further 0.05-30 micrometers, especially 0.1-20 micrometers) are desirable. It is in the condition that were hard to apply this particle diameter in less than 0.01 micrometers since the fluidity of coating liquid was bad, and the diameter of an ink dot was small, printing concentration became low, smooth nature fell when 50 micrometers was exceeded conversely, and the front face was rough and is not desirable. The loadings of this non-subtlety particle are the 0.1 - 10000 weight section (the 1 - 5000 weight section, especially the 5 - 1000 weight section are still more desirable, and in under the 0.1 weight section, if it becomes easy to produce a blot of an alphabetic character and these loadings exceed the 10000 weight sections conversely, they become easy to produce the fall of coloring concentration and are not desirable.) to the PVA100 weight section. When the amount of a non-subtlety particle is lessened when transparency is required like the film for OHP (overhead project) with a natural thing (the amount of concrete is 0.1 - 10 weight section extent), and white is required like paper, what the amount of a non-subtlety particle is made [ many ] for within the limits of the solid content mentioned later (the amount of concrete is 100 - 10000 weight section extent) is desired.

[0013] It responds to the resin constituent used by this invention at the need. Moreover, glyoxal, Deck-watertight-luminaire-ized agents, such as a urea-resin, polyamide polyamine epichlorohydrin, and polyethyleneimine, A defoaming agent, a release agent, a surfactant (except the above-mentioned hydrophilic-group content fluorine system compound), Well-known additives, such as antiseptics, an insecticide, a rust-proofer, and a thickener, can also be added. Moreover, if it is the range which does not spoil the description of this invention, resin, such as other paper processing agents, for example, other well-known polyvinyl alcohol, starch, a carboxymethyl cellulose, an acrylic latex, and an SBR

latex, is also conventionally mixable.

[0014] In this invention, although the resin constituent like the above contains in the coating layer on the inside of a base material, and/or the front face of a base material, although there is especially no limit, as this base material, paper of fine quality, a report grade paper, glassine (semi), glossy paper, coat paper, a PET sheet, a PVC sheet, a PEN (polyethylenenaphthalate) sheet, a PET film, a PVC film, a PEN film, etc. are used suitably, for example.

[0015] In carrying out coating of the resin constituent to this base material, the approach of well-known arbitration, such as a size press coat, the roll coater method, an EYA Doctor process, the blade coating-machine method, and the gate roll coater method, is adopted, but When carrying out coating of this resin constituent, it is desirable that solid content considers as 0.5 – 70% of the weight (further 2 – 60 % of the weight) of a water solution. This solid content at less than 1 % of the weight There is little coating weight, and since printing concentration and surface paper durability reinforcement also become a low thing lacking in practicality, coating becomes difficult since the viscosity of coating liquid will become high if 70 % of the weight is exceeded conversely, and coating spots are also produced, it is not desirable. It is appropriate to make it 0.1 – 40 g/m<sup>2</sup> (solid content conversion) and the coverage of the resin constituent by which coating is carried out to a base material become 0.5 – 20 g/m<sup>2</sup> (same as the above) extent preferably especially. Although this resin constituent contains in the coating layer on the inside of a base material, and/or the front face of a base material and the record medium for ink jets is obtained in this way, as for especially the resin constituent of this invention, it is useful to use for the overcoat layer of the record medium for ink jets, and it explains it more concretely about this application.

[0016] As mentioned above, it is desirable to carry out coating so that it may be prepared in the front face of an ink acceptance layer prepared on the base material and the thickness after desiccation may be set to 0.1–1000 micrometers (further 0.3–500 micrometers), and if this thickness becomes insufficient [ less than 0.1 micrometers / a water resisting property ] and this overcoat layer exceeds 1000 micrometers conversely, it becomes a defect and is not desirable [ a layer / ink acceptance nature ]. Moreover, the content of this resin constituent in the coating liquid which carries out coating has 0.5 – 70 desirable % of the weight (further 2 – 60 % of the weight), at less than 0.5 % of the weight, coating weight has few these contents, and its water resisting property is inadequate. Conversely, when 80 % of the weight is exceeded, viscosity is high, and coating nature becomes a defect and is not desirable. Although there is especially no limit in this coating, the Ayr knife, a blade coating machine, the roll coater method, etc. are usually used. Although it is useful to use for the overcoat layer of the record medium for ink jets like the above, the resin constituent of this invention obtained in this way can be used also for the ink acceptance layer of this record medium, and at this time, it mixes with pigments (a titanium dioxide, a synthetic silica, an alumina, calcium carbonate, etc.) at a rate of the one to 10000 section to the PVA100 weight section, and it adds a coloring agent (color) and solvents (water, alcohol, glycol, etc.) further.

[0017]

[Example] Hereafter, an example is given and this invention is explained concretely. In addition, among an example, especially, that it is with the "section" and "%" shows weight criteria, as long as there is no notice. With the following formation PVA of (A) AA and a (B) average degree of polymerization of 2600 or more PVA was prepared.

AA-izing PVA (A-1); (A) Acetoacetic ester radical content % of one mol, Whenever [ saponification ] AA-ized PVA(A-2); content [ acetoacetic ester radical ] % of one mol of 94-mol % and average degree of polymerization 2500, Whenever [ saponification ] AA-ized PVA(A-3); content [ acetoacetic ester radical ] % of six mols of 88-mol % and average degree of polymerization 3000, Whenever [ saponification ] AA-ized PVA(A-4); content [ acetoacetic ester radical ] % of six mols of 95-mol % and average degree of polymerization 2800, Whenever [ saponification ] AA-ized PVA(A-5); content [ acetoacetic ester radical ] % of three mols of 82-mol % and average degree of polymerization 3800, Whenever [ saponification ] AA-ized PVA(A-6); content [ acetoacetic ester radical ] % of three mols of 93-mol % and average degree of polymerization 3000, Whenever [ saponification ] With an AA-ized PVA (B) average degree of polymerization [ of the degree % and the average degree of polymerization 5000 of 90 mols of saponification ] of 2600 or more PVA (B-1); 95-mol %, Whenever [ PVA(B-3);



saponification / of 90 mol % and average degree of polymerization 4000 ] PVA of average degree of polymerization 3500 (B-2); 93-mol %, [ whenever / saponification ] PVA of average degree of polymerization 2500 (B-4); it is [ whenever / saponification / whenever / PVA(B-5); saponification / of 88 mol % and average degree of polymerization 3500 ] PVA [0018] of 88-mol % and average degree of polymerization 3000 whenever [ PVA(B-6); saponification / of 85 mol % and average degree of polymerization 3000 ]. The resin constituent of this invention which consists of the 60 (A-1) sections of the example 1 above and (B-1) the 40 sections was obtained. The following ways estimated the obtained resin constituent. The obtained resin constituent carried out water-solution preparation 10%, heat treatment was carried out for 2 minutes at 100 degrees C after cast film production so that it might become the thickness of 30 micrometers on a PET film, and the film for evaluation was produced. Subsequently, the dipping of this film (10cmx10cm) was carried out to 20-degree C water for 1 hour, and the degree of swelling and the rate of elution were measured in the following ways. (Rate of swelling) After the dipping, the film was taken out, surface attached groundwater was removed through the filter paper, weight W1 (g) was measured, the weight W2 (g) dried at 105 more degrees C for 3 hours was measured, and it computed by the following formula.

Degree of swelling (twice) =  $W1 (g) / W2 (g)$

[0019] (Rate of elution) Shigekazu Ushiro W1 (g) who dried the film in front of a dipping at 105 degrees C for 3 hours was measured, Shigekazu Ushiro W2 (g) who you took [ Shigekazu ] out the film and made it dry at 105 degrees C after a dipping for 3 hours was measured, and it computed by the following formula.

rate (%) of elution =  $\{(W1(g)-W2(g)) / W1(g)\} \times 100$  -- the further above-mentioned reinforcement and ductility of the film for evaluation -- JIS It measured based on K6783. moreover, a synthetic silica (the Fuji SHIRISHIA chemistry company make --) amorphous in the resin constituent 2.5 above-mentioned section "SAIRISHIA 446", a configuration : With a globular form, the particle diameter:4.5-micrometer seven sections, and the dimethylolurea 0.5 section, make it dissolve in the water of the 90 sections, and coating liquid is obtained. After performing a bar coat so that it may become 10.0 g/m<sup>2</sup> to the paper of fine quality of basis-weight 100 g/m<sup>2</sup> by resin solid content about this coating liquid, it dried for 2 minutes at 105 degrees C with the cylinder rotating type dryer. About the obtained record medium for ink jets, the condition (in Table 2, it is only described as a feather ring) of printing concentration, a water resisting property, and a feather ring and evaluation of blocking resistance were performed in the following ways.

[0020] (Printing concentration) Each color of yellow, cyanogen, and a MAZEN dub rack was recorded on the obtained record medium for ink jets with the ink jet printer (the Seiko Epson make, "PM-750C") (printing), and printing concentration was measured for the record part with the Macbeth densimeter (made in Macbeth, "RD914 mold"), respectively.

(Water resisting property) The printing back was dropped at the obtained record medium for ink jets, water was dropped at the front face with the ink jet printer (the Seiko Epson make, "PM-750C"), water was wiped off with tissue paper after 15-second progress, visual observation was carried out and the decoloring condition of a printing part was evaluated as follows.

O --- hardly decolored \*\* --- x decolored a little --- [0021] with intense decoloring (Condition of a feather ring) It is an ink jet printer (the Seiko Epson make, "PM-750C") to the obtained record medium for ink jets. After printing, visual observation was carried out and the blot (feather ring) situation of the alphabetic character was evaluated as follows.

O --- \*\* as which a blot is hardly regarded --- x as which a blot is regarded a little --- The blot investigated the blocking condition of this record medium after neglect for five days in the state of 40 degrees C and 90%RH, having covered in piles the record medium for ink jets which might be remarkable (blocking resistance) for five 10kg/cm<sup>2</sup> loads from on the, and evaluated as follows.

O --- \*\* as which most blocking is not regarded --- x as which blocking is regarded partially ---

[0022] as which blocking is regarded by the whole Using the formation PVA of \*\*\*\*\* (A) AA shown in one to examples 2-6 and example of comparison. 2 table 1, and 2600 or more (B) average degree of polymerization PVA, the record medium for ink jets was produced like the example 1, and it evaluated similarly according to the example 1.

Using with the formation PVA of \*\*\*\*\* (A) AA shown in seven to example 12 table 1, and a (B) average

degree of polymerization of 2600 or more PVA, coating liquid was prepared like the example 1, and except having carried out coating to the PET (polyethylene terephthalate) film (95% of transparencies) with a thickness of 50 micrometers, the record medium for ink jets was produced like the example 1, and it evaluated similarly according to the example 1. The evaluation result of an example and the example of a comparison is shown in Tables 2 and 3.

[0023]

[Table 1]

(A) A component (B) Component Class Combination section class The combination section Example 1  
 (A-1) 60 (B-1) 40 \*\* 2 (A-2) 80 (B-2) 20 \*\* 3 (A-3) 70 (B-3) 30 \*\* 4 (A-4) 60 (B-4) 40 \*\* 5 (A-5) 40  
 (B-5) 60 \*\* 6 (A-6) 60 (B-6) 40 \*\* 7 60 (A-1) (B-1) 40 \*\* 8 (A-2) 80 (B-2) 20 \*\* 9 (A-3) 70 (B-3) 30  
 \*\* 10 (A-4) 60 (B-4) 40 \*\* 11 (A-5) 40 (B-5) 60 \*\* 12 (A-6) 60 (B-6) 40 Example 1 of a comparison  
 (A-1) 100 (B-1) 0 \*\* 2 (A-1) 0 (B-1) 100 [0024]

[Table 2]

Degree of swelling Whenever [ elution ] Reinforcement Ductility (Twice) (%) (kg-cm<sup>2</sup>) (%) Example 1 1.5  
 15 730 300 \*\* 2 1.3 19 660 270 \*\* 3 1.9 20 650 250 \*\* 4 1.6 12 610 170 \*\* 5 2.2 37 580 310 \*\* 6 2.4  
 25 550 240 \*\* 7 3.1 20 570 220 \*\* 8 2.2 16 510 180 \*\* 9 1.625 790 220 \*\* 10 1.429 620 150 \*\* 11 1.4  
 27550 160 \*\* 12 1.8 22 560 180 Example 1 of a comparison 3.5 40 310 350 \*\* 2 8.2 90 460 480 [0025]

[Table 3]

Printing concentration Water resisting property Feather ring Blocking resistance Yellow Cyanogen  
 MAZEN dub rack Example 1 1.35 1.33 1.35 O O O \*\* 2 1.29 1.28 1.34 O O O \*\* 3 1.40 1.37 1.33 O O  
 O \*\* 4 1.33 1.43 1.38 O O O \*\* 5 1.43 1.35 1.31 O O O \*\* 6 1.37 1.32 1.29 O O O \*\* 7 1.32 1.43 1.34 O  
 O O \*\* 8 1.34 1.44 1.32 O O O \*\* 9 1.29 1.32 1.33 O O O \*\* 10 1.33 1.33 1.32 O O O \*\* 11 1.29 1.33  
 1.37 O O O \*\* 12 1.42 1.39 1.29 O O O Example of comparison 1 1.30 1.21 1.17 x \*\* x \*\* 2 0.92 0.98  
 0.88 O x O [0026]

[Effect of the Invention] The resin constituent of this invention is excellent in film physical properties, such as a water resisting property, a mechanical strength, and flexibility, and can be used for a film, a paper processing agent, various coating applications, etc., and especially when it is useful for the coating application of the record medium for ink jets and uses for this application, improvement in the condition of printing concentration, a water resisting property, and a feather ring, blocking resistance, surface paper durability reinforcement, etc. can be carried out.

[Translation done.]